

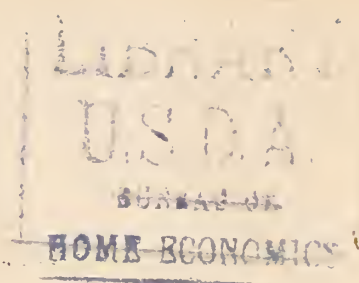
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UNITED STATES DEPARTMENT OF AGRICULTURE  
BUREAU OF HOME ECONOMICS  
WASHINGTON, D. C.



NUTRITIVE VALUE OF BUTTER AND MARGARINES

Proximate Composition and Fuel Value

Butter and margarines vary considerably in composition, especially in the water and fat content and consequently in fuel value. Each is required to contain at least 80 percent fat. The figures given are average ones for the product.

	Water	Protein and carbohydrates	Fat	Ash	Calories per pound
	Percent	Percent	Percent	Percent	
Butter.....	15.5	1	81	2.5	3,325
Margarine ..	13	1	83	3	3,405

Report on food products and drug products. E. M. Bailey. Conn. Agr. Expt. Sta. Bull. 210: 200-203. 1918; Bull. 227: 234-236. 1920; Bull. 236: 247-249. 1921.

Nut margarins. J. T. Kiester. Jour. Assoc. Off. Agr. Chem. 6 (4): 502-508. 1923.

Composition of creamery butter and its control. C. H. Eckles, J. R. Keithley, and W. B. Combs. Minn. Agr. Expt. Sta. Bull. 223. 1925.

Food and drugs. J. M. Bartlett. Maine Agr. Expt. Sta. Off. Insp. 119: 22. 1926.

The moisture content of oleomargarine. R. H. Kerr. Jour. Assoc. Off. Agr. Chem. 11 (3): 382-386. 1928.

Food and drug bulletin with analyses and registration of beverages and commercial feeds. C. S. Ladd. N. Dak. Regulatory Dept. Bull. 40: 13-27. 1933.

Food and drug bulletin with analyses and registration of beverages, feeds and other products. C. S. Ladd. N. Dak. Regulatory Dept. Bull. 42: 13-27. 1934.

See also references by Poe and Fehlmann, page 4.

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## Digestibility and Vitamin Content

Butter and margarines are similar in digestibility but they differ considerably in vitamin A content. As a rule margarines contain little or no vitamin A which is so abundant in butter. The vitamin content of oleomargarine depends on the source of the fat and the process of manufacture. Beef fat contains some vitamin A and margarines made from it may retain a small amount of this factor. Those made from coconut fat, cottonseed oil, peanut oil, or hydrogenated vegetable oils contain practically none unless it is added during the manufacturing process.

If margarines are to be used in the diet as butter substitutes, care must be taken to include other adequate sources of vitamin A.

Further observations on the influence of natural fats upon growth. T. B. Osborne, L. B. Mendel, et al. Jour. Biol. Chem. 20: 379-389. 1915. (Abs. in Expt. Sta. Rec. 33: 262. 1915.)

Beef fat contains more vitamin A than lard but much less than butter fat. The fact that it contains less than butter fat may be due to its high content of the harder fats since in butter vitamin A is generally associated with the softer parts.

Investigations of the nutritive value of hardened fats. C. A. Pikelharing, and W. Schut. Pharm. Weekbl. 53 (26): 769-785. 1916. (Abs. in Expt. Sta. Rec. 41: 362. 1919.)

Rats on diets where fat consisted of hardened fats did not grow. Mice grew at customary rate and dogs assimilated most of the fat.

The nutritive value of margarins and butter substitutes with reference to their content of the fat-soluble accessory growth substance. W. D. Halliburton, and J. C. Drummond. Jour. Physiol. 51: 235-251. 1917. (Abs. in Expt. Sta. Rec. 38: 265. 1918.)

Oleo-oil contains some vitamin A and for this reason oleo-oil margarines would contain some of this factor. Margarines prepared with a basis of coconut fat, cottonseed oil, arachis (peanut) oil, or hydrogenated vegetable oils, are not equal to butter nor to oleo-oil margarines since these vegetable oils do not contain any appreciable amount of vitamin A.

Fat soluble vitamin. H. Steenbock, P. W. Boutwell, and H. E. Kent. Jour. Biol. Chem. 35: 517-526. 1918. (Abs. in Expt. Sta. Rec. 39: 770. 1918.)

Different butters vary in their vitamin content, according to variations in the ration of the cow, duration and methods of storage, etc. Most oleomargarine contains little of the liquid portions of beef fat and therefore is much inferior to butter.



Fats and fatty acids as food. V. The fat-soluble accessory factor. J. S. Drummond. Jour. Physiol. 52: 344-346. 1919. (Abs. in Expt. Sta. Rec. 41: 361-362. 1919.)

Margarines consisting of hydrogenated animal fats (e.g., whale oil which contained the vitamin before hydrogenation) have no vitamin value.

A study of the fat metabolism of infants and young children. IV. The digestion of some vegetable fats by children on a mixed diet. L. E. Holt, A. M. Courtney, and H. L. Fales. Amer. Jour. Diseases Children 18 (3): 157-172. 1919. (Abs. in Expt. Sta. Rec. 42: 60-61. 1920.)

Margarin. W. Clayton. Published by Longmans, Green and Co., London and New York. 1920. (Abs. in Expt. Sta. Rec. 44: 258. 1921.)

Discussion of digestibility and content of fat-soluble vitamin.

The vitamin doctrine and the oleomargarin industry, W. D. Richardson. Inst. Margarin Manfrs. Proc. 2: 11-26. 1921. (Abs. in Expt. Sta. Rec. 46: 256. 1922.)

A plea for use of margarine in place of butter as butter making is economically wasteful due to loss of buttermilk. Other foods contain vitamin A.

Vitamins and the future of margarin manufacture. C. Funk. Chem. Age [New York] 30 (5): 227-230. 1922. (Abs. in Expt. Sta. Rec. 47: 662. 1922.)

Lecture. Margarines differ from butter in that they lack vitamin A. Suggests better manufacturing methods and possibly the incorporation of a small amount of cod-liver oil.

The analysis of margarin. G. D. Elsdon. Chem. Age [London] 8 (202): 450-452. 1923. (Abs. in Expt. Sta. Rec. 49: 505. 1923.)

Recommends including beef fat or butter fat in all margarines in order to supply the deficiency of vitamin A.

Food values and vitamins from the manufacturers standpoint. A. D. Holmes. Amer. Food Jour. 18 (7): 321. 1923. (Abs. in Expt. Sta. Rec. 50: 365. 1924.)  
Study of manufacturing uses of oleomargarine.

The digestibility of fats. C. F. Langworthy. Jour. Indus. and Engin. Chem. 15: 276. 1923. (Abs. in Expt. Sta. Rec. 49: 276. 1923.)

Includes results of experimental work on a large number of animal and vegetable fats and hydrogenated oils. Summarizes earlier reports from the same laboratory (U. S. Dept. Agr.).

Old and new ideas in diet. P. B. Hawk. Amer. Food Jour. 19: 379. 1924.

The vitamin content of margarine. K. H. Coward. Lancet [London], pt. 2, pp. 726, 727. 1928. (Abs. in Jour. Home Econ. 21: 612. 1929.)

Quantitative determination of vitamins A and D in 14 samples representing 4 brands of oleomargarine advertised to contain concentrates of these vitamins and of the same number of samples of fresh butter. Both were purchased simultaneously in ordinary retail shops in London. The margarines were equal to the best summer butter in both A and D and were more constant in content of vitamin D than butter.

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The vitamin A and D content of some margarines. D. Fetter, and A. J. Carlson. Amer. Jour. Physiol. 96 (2): 257. 1931. (Abs. in Jour. Amer. Med. Assoc. 96 (16): 1337. 1931)

An animal fat margarine churned in whole milk was found by Fetter and Carlson to be equal to butter in vitamin A content. A margarine made from coconut oil was very deficient in vitamin A. The oleo-oil-lard-milk margarine was superior to butter in vitamin D content.

The comparative vitamin A content of nut-margarines and butter. C. F. Poe, and H. A. Fehlmann. Jour. Dairy Sci. 16 (6): 559-564. 1933.

A number of samples of uncolored nut margarines purchased on the open market were tested for vitamin A in comparison with samples of pasteurized and unpasteurized butter. Compared to butter, nut margarines are very poor sources of vitamin A. Considerable vitamin A effect was shown by 0.05 gram of butter, while 1.0 gram of the margarines had little or no effect. Considerable variation was noted in the fat content of the different nut margarines.

Vitamin A content of naturally colored nut margarines. C. F. Poe, and H. A. Fehlmann. Indus. and Engin. Chem. 25 (4): 402-403. 1933.

A study of the vitamin A content of eight nut margarines colored by the addition of palm oil showed palm oil to be a source of the vitamin. None of the other fat constituents contained any appreciable amount of vitamin A. Considerable variation was noted in the different margarine samples. The Sherman vitamin units per gram ranged from 0.65 to 4.7.